

# Preparing for Complexity and Wicked Problems through Transformational Learning Approaches

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As the information environment becomes increasingly complex and challenging, Library and Information Studies (LIS) education is called upon to nurture innovative leaders capable of managing complex situations and “wicked problems.” While disciplinary expertise remains essential, higher levels of mental complexity and adaptive capabilities are also needed to manage complexity. This article reviews three transformational learning approaches with the potential to effectively guide student growth toward these higher levels: (1) overcoming immunity to change, (2) threshold concepts and variation theories, and (3) transformative learning theory. All three approaches aim at transforming high-level meanings that are limiting into understandings that empower in order to achieve pragmatic goals, comprehend foundational disciplinary concepts, and generate new frames of reference for social justice.

## Introduction

As society becomes increasingly complex and reshaped by technological innovation, Library and Information Science (LIS) professionals are called upon to develop themselves and to assist those they serve to meet new challenges emerging in the digital age. At the 2014 ALA Summit on imagining the future of libraries, thought leaders from libraries, educational organizations, federal agencies, and foundations identified key themes for the future: the changing role of libraries and the implications for LIS education, re-envisioning library service, libraries as community hubs, and rebranding libraries (Bolt, 2014, p. 1–3). Recently, the Association of College and Research Libraries (ACRL) Research Planning and Review Committee (2013) undertook an environmental scan that also identified key trends and changes needed for the future, notably entrepreneurial thinking, radical collaboration, and LIS education that fosters innovation and creative leadership skills.

These are complex challenges with disruptive and transformational potential.

As we move from ideas to action, a critical issue that arises is the gap between the world’s complexity and our abilities to manage such complexity (Kegan & Lahey, 2009). Managing complexity demands more than technical knowledge; it requires the ability to make adaptive changes in our thinking, beliefs, and behavior (Heifetz & Linsky, 2002a). Recent developments in learning theories and teaching practice are often responses to some form of this critical question: How can we help our students prepare for the future in a complex, rapidly changing environment?

Behind that question is a belief that new forms will emerge that are unimaginable now, and that increasing our knowledge and skills within existing frameworks will not suffice in dealing with novel situations. What we come to know through informational learning will still be fundamental, but changes in *how* we know through transformational learning will also be critical (Kegan, 2000). That is the premise for this examination of three transformational learning approaches that have the potential to help students move toward higher levels of mental complexity: (1) overcoming im-

munity to change, (2) threshold concepts and variation theories, and (3) transformational learning theory.

We begin the examination with a look at some difficult challenges LIS professionals are likely to face in the future. Against that backdrop, the approaches will be introduced in turn, covering brief history, significance, and key tenets. Each approach illuminates a different kind of transformation, rests on a solid research foundation, and has had significant impact on education or practice. The final section compares the approaches and discusses the implications for LIS education.

### **A Glimpse of the Future: In the Shadow of Complexity**

That social systems, technological systems, and the information environment are becoming increasingly complex is undeniable, but our understanding of what this means is more nuanced due to work on complexity theory and wicked problems. Understanding degrees of complexity allows us to make distinctions to guide decision-making (Miller & Page, 2007; Snowden & Boone, 2007). *Simple contexts* are stable and governed by causal relationships that are obvious to all; problems are solved through best practices. In *complicated systems*, elements are numerous and varied, and the causal relationships among them are less obvious. Because the elements are relatively independent of each other, changes to or removal of one element will not affect the others. Solving problems in complicated contexts requires data gathering and analysis by experts to find a good solution from among possible solutions. Finally, *complex adaptive systems* consist of interdependent, interacting elements that respond as an integrated whole to internal or environmental changes. This type of system is irreducible to its parts and solutions are emergent, discovered through experimentation and observation.

Distinguishing between complicated

and complex social contexts can be challenging, in part because complicated worlds can become complex when human actors are involved. But making the distinction is important, as this affects how we understand and handle problems. An example of the importance of making these distinctions in LIS contexts is a study by MacLeod and Childs (2013) on electronic records management as a wicked problem.

Social complexity gives rise to wicked problems (also known as messes), the most challenging type of problem to understand and to solve (Rittel & Webber, 1973; Conklin, 2006; Snowden & Boone, 2007). Wicked problems exist in a context that is in flux and unpredictable. They have no obvious problem statement, no apparent causal relationships, and are thus not amenable to the application of best practices, expert diagnoses, or fact-based management. Conklin (2006, p. 16) provides some examples of wicked problems: how to deal with crime and violence in schools, where to route a new highway, what our new mission statement should be, and what features our new product should have. In solving wicked problems, the quality of leadership is critical: "A leader, from above or below, with or without authority, has to engage people in confronting the challenge, adjusting their values, changing perspectives, and learning new habits" (Heifetz & Laurie, 1997, p. 134). Over the past several decades, Heifetz and his colleagues (Heifetz & Laurie, 1997; Heifetz & Linsky, 2002a) have advanced the concepts of adaptive change and adaptive leadership, which have been adopted by business, government, and nonprofits for social change. The most important work of adaptive leaders is to: (1) question the paradigm, (2) think and act collaboratively, (3) experiment to understand the problem and emergent solution, (4) use conflict to mobilize creative responses, and (5) do continual high-level reflection.

*Question the paradigm.* "The existence of a mess is strong evidence that the paradigm is not able to resolve the problem

and in fact may be the cause of the mess. Therefore, try to identify all the assumptions in the belief system and see if any of them is questionable in the current situation” (Denning, 2007, p. 25). Uncovering questionable assumptions that are integrally tied to values, perspectives, and identity can be both a liberating and a threatening, divisive process (Heifetz & Linsky, 2002, p. 101–102).

*Think and act collaboratively.* “Because of social complexity, solving wicked problems is essentially a social process” (Conklin, 2006, p. 29). In looking for solutions outside the current paradigm, different perspectives and dissent are crucial for generating new ideas. Conklin’s (2006) dialogue mapping process and Snowden’s (Kurtz & Snowden, 2003) Cynefin sense-making process are examples of methods for framing and sustaining productive dialogue. To ensure that this process is inclusive, voices of leadership from below must be protected. All involved should recognize that the problem and the solution exist within themselves and should take responsibility for change (Heifetz & Laurie, 1997).

*Experiment to understand the problem and discover emergent solutions.* The dimensions of a wicked problem become clear only through experimenting with possible solutions and considering and/or testing their effects. This is a creative learning process that involves willingness to take risks. Environments and methods are needed that allow patterns and solutions to emerge (Kurtz & Snowden, 2003).

*Use conflict to mobilize creative responses.* “Some of the most creative ideas come out of people in conflict remaining in conversation with one another. . . . The challenge for leaders is to develop structures and processes in which such conflicts can be orchestrated productively” (Heifetz & Linsky, 2002b, p. 33). Leaders must counteract ways of avoiding change, such as scapegoating, denial, and blame. When conflicts are polarized and superficial, a leader must deepen the debate through

questioning and reframing issues. All involved must have the emotional capacity to tolerate uncertainty, frustration, and anxiety (Heifetz & Laurie, 1997, p. 127).

*Do continual high-level reflection.* To step back from action and assess what is happening from a high-level perspective is essential but challenging (Heifetz & Linsky, 2002b; Schon, 1983). It is difficult to take the time to stop acting and assess how complex factors related to actions, context, and people are furthering or obstructing change. Honest, fearless self-awareness is critical for seeing clearly, as our beliefs and assumptions shape what we see.

This glimpse of the future puts our students in the shadow of complexity as future LIS professionals. It seems clear that an education in disciplinary expertise and best practices is necessary but not sufficient for future effectiveness. We now turn to three transformational learning approaches that have potential to strengthen the ability to manage complex systems and wicked problems.

### **Immunity to Change: Breaking Down Barriers to Pragmatic Action**

Until the 1980s, most experts believed that the brain’s capacity for change ceased in late adolescence and that the “wisdom that comes with age” was due to experience rather than qualitative changes in mental complexity (Kegan & Lahey, 2009, Chapter 1, Section 1, para. 1). Subsequent research on cognitive development (e.g., Belenky, *et al.* 1986; Kegan, 1982, 1994; King & Kitchener, 2004), the flourishing research on neural plasticity, and advances in learning theories indicate that adults can and do develop more complex cognitive abilities throughout their lives.

Adult developmental psychologists Kegan and Lahey (2001, 2009) have developed a process they call overcoming the immunity to change to address our lack of understanding of what prevents change. Based on over three decades of research, Kegan (1982, 1994) has identified three

increasingly complex levels of consciousness occurring among adults.

- *The socialized mind* is shaped by expectations from the personal environment, and the self aligns with personal relationships, schools of thought, or both.
- *The self-authoring mind* has developed a center of personal authority, and the self aligns with its own belief system, voice, and ability to direct its own actions.
- *The self-transforming mind* understands the limits of personal ideologies and authority and realizes that contradiction, opposites, and multiple systems are needed for wholeness. The self “coheres through its ability not to confuse internal consistency with wholeness or completeness, and through its alignment with the dialectic rather than either pole” (Kegan & Lahey, 2009, Chapter 1, Section 2, para. 2).

Two different large-scale studies of the distribution of mental complexity among adults (Torbert, 1987; Kegan, 1994) showed that 58% of adults had not reached the level of the self-authoring mind, and very few had moved beyond it (Kegan & Lahey, 2009, Chapter 1, Section 4, para. 11).

To meet the challenges of the future, Kegan and Lahey believe that we must move toward more complex levels; otherwise, our learning and ability to solve problems will occur within our existing mindsets. However, efforts at change are obstructed by a deeply rooted internal system of barriers (an “immunity system”) that individuals construct for self-protection against perceived danger. Kegan and Lahey have developed a systematic process for overcoming the immunity to change, exemplified by numerous case studies, including one of librarians at a large research university who moved from the periphery of university governance to full partnership (Kegan & Lahey, 2009, Chapter 11, Section 4, para. 5).

Individuals or teams create an “immu-

nity map” in which they articulate high priority goals that have been elusive, identify behavior that is contrary to the goals, uncover hidden commitments that support self-defeating behavior, and identify the “big assumptions” (previously unquestioned tenets) that sustain the immune system and must be changed to achieve the goals. The final step is a targeted plan of action to achieve the goals with a changed mindset. Creating an immunity map is the opportunity to engage “in focused, structured, persistent, and active reflection” (Kegan & Lahey, 2009, Conclusion, Section 4, para. 5). In essence, the work of immunity mapping is a step toward a higher level of mental complexity.

The immunity to change approach helps overcome two major barriers to solving wicked problems: a self-limiting mindset and self-defeating behavior. Key contributions are its research-based descriptions of levels of mental complexity and a systematic process for moving to higher levels. A challenge to educators is the lack of attention to applying the process within higher education.

### **Threshold Concepts and Variation Theories: Transforming Professional Understanding**

Threshold concepts theory and variation theory developed separately, but efforts toward a synthesis of these complementary theories have recently begun. We will review each theory in turn before looking at two efforts at theoretical and practical integration.

#### ***Threshold Concepts Theory: Mastering Conceptual Gateways***

Threshold concepts theory has been widely embraced by educators since its introduction in 2003 by Meyer and Land. The Threshold Concepts Conference held its fifth biennial session in 2014. The Threshold Concept web page (<http://www.ee.ucl.ac.uk/~mflanaga/thresholds.html>)

maintained by Michael Flanagan, University College London, lists numerous publications in a range of remarkably diverse fields.

Threshold concepts theory is beginning to have an impact on the LIS field. In response to changes in user behavior, technology, and the information environment, ACRL revised its information literacy standards by creating a new framework founded on six threshold concepts (<http://acrl.ala.org/ilstandards/>). Tucker and colleagues (2014) provide an overview of the theory and its potential for LIS curriculum development, research, and practice.

What are threshold concepts? According to Meyer and Land (2003, p. 1), a “threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress.” The essential characteristics of threshold concepts are that they are:

- *Troublesome*—difficult to understand because a disciplinary understanding can be alien or counter-intuitive to novices.
- *Transformative*—understanding results in a qualitative shift in perspective on the subject, and possibly in sense of identity and worldview.
- *Integrative*—full understanding exposes hidden inter-relatedness in the subject/discipline.
- *Irreversible*—unlikely to be forgotten, indeed, students may “forget” what it was like not to understand.
- *Bounded*—may constitute a boundary between conceptual areas or disciplines (Akerlind, Mackenzie, & Lupton, 2011, p. 2).

Akerlind, Mackenzie, and Lupton (2011) provide a concise description of how and why threshold concepts are both important and challenging:

[W]ithin each discipline, there are a limited number of concepts that are ‘threshold’ in nature, so-called because they act as ‘conceptual gateways’ to disciplinary ways of thinking about a subject area. . . .

[They] enable students to coherently integrate what were previously seen as unrelated aspects of the subject, . . . leading not only to new ways of understanding a subject area, but a shift in the learner’s sense of professional or disciplinary identity. . . . However, the transformative and integrative nature of these concepts makes them commonly troublesome for students to learn . . . misunderstandings have long-lasting implications for students’ learning in the subject area, and their ability to apply that learning in professional practice. This makes Threshold Concepts a particularly valuable area on which to focus extra curriculum design attention. (p. 2)

An understanding of threshold concepts in LIS could be a powerful conceptual and ontological tool for solving wicked problems, because such understanding would encourage taking high-level disciplinary perspectives and continually questioning the adequacy of one’s view.

A crucial aspect of acquiring understanding of a threshold concept is experiencing liminality, described as “the state in which there are two competing ways of seeing a situation, one the established but increasingly inadequate way and the other a new, more powerful and comprehensive way of seeing” (Baillie, Bowden, & Meyer, 2013). Because threshold concepts are a challenge to conceptual understanding and even professional identity formation, liminality has been likened to a rite of passage (Meyer & Land, 2006).

It is in developing the power to see differently that variation theory becomes important.

## Variation Theory: Learning to Be Discerning

Variation theory and its associated re-



search methodology, phenomenography, emerged from empirical research in K-12 education done by Ference Marton and his colleagues beginning in the 1970s (Marton & Booth, 1997, p. 14–16; Yates, Partridge, & Bruce, 2012, p. 97). Its articulation as a theory of learning and awareness has been gradual, with contributions particularly from scholars in Sweden, the UK, Australia, and Hong Kong (Akerlind, 2005, p. 321).

Variation theory uses differentiation to enable students to become more discerning and capable of handling novel situations. Akerlind, Mackenzie, and Lupton (2011) provide a concise description of the process of learning through variation:

According to Variation Theory, misunderstandings (or less sophisticated understandings) of a disciplinary concept may be explained in terms of students' lack of awareness of key features or aspects of the concept. Learning is thus seen as occurring through a shift in awareness, where a student becomes aware of aspects of a concept that they had not previously noticed. It is argued that awareness of a conceptual feature is best facilitated by drawing students' attention to variation in that feature. Therefore, student learning of a concept is best facilitated by introducing variation in each of the critical features of the concept into teaching and learning activities. (p. 2)

Experiencing variation also leads to sensitization to aspects of the environment, and this awareness becomes the basis for seeing aspects of future situations. One must also be able to discern new critical features of a phenomenon, but “even the discernment of entirely new features depends on the variation that you have encountered earlier” (Marton, Runnesson, & Tsui, 2004, p. 11).

The significance of variation theory for higher education was extensively explored by Bowden and Marton (1998) in *The University of Learning*. They argue that “preparing students for situations in the future amounts to developing their capabilities for seeing in effective ways ... The only

way we can prepare for the undefinable variation in the future is by experiencing variation in the present and by having experienced variation in the past” (p. 281).

### ***Synthesis of Threshold Concepts and Variation Theories***

Oversimplified, threshold concepts theory focuses on the content of learning, and variation theory addresses the process. Recognition of the complementarities of the two theories has recently led to advances in theory and practice through their integration.

Baillie, Bowden, and Meyer (2013) have proposed a theoretical integration of threshold concepts with capability theory, which is “firmly based in phenomenography and variation theory” (p. 227). The integrated theory is intended to aid in “the development of learning for an unknown future—to enhance the capacity of students to learn an as yet undiscovered concept themselves, once they encounter it” (Baillie, Bowden, & Meyer, 2013, p. 241).

The Australian Learning and Teaching Council's Threshold Concepts and Variation Theory Project (<http://www.thresholdvariation.edu.au>) developed, implemented, and evaluated a curriculum design model to aid student learning of threshold concepts through variation theory. The project used two contrasting disciplines as case studies (physics and law) and was implemented at four varied institutions (Akerlind, Mackenzie, & Lupton, 2011, p. 1).

At the end of the project, student outcomes were generally in line with expectations. Regarding participating faculty, however, the outcomes far exceeded expectations, particularly in faculty understanding of what students found difficult and in improvements in their own understanding of the concepts. According to the project developers, “the perceived benefits were profound. . . . Participants reported benefits, sometimes of a transformational nature” (p. 19).

Helping students acquire the gateway knowledge and adaptive capabilities to act effectively in the future is the explicit goal of threshold concepts and variation theories. A synthesis of these theories contributes to our view of how individuals make conceptual breakthroughs in disciplinary or professional understanding through becoming more discerning about ideas, experience, and the social environment. These are critical skills for managing complexity and solving wicked problems.

### **Transformative Learning Theory: New Frames of Reference for Social Justice**

Since its inception in the 1980s from Jack Mezirow's (1978) research on older women's reentry programs for a return to formal education or the workforce, transformative learning theory has overshadowed Knowles' andragogy and moved to the center of the study of adult learning (Merriam, Cafferella, & Baumgartner, 2007; Cranton & Taylor, 2012), as well as to the forefront of future-oriented education theories (Kalantzis & Cope, 2012). The theory's philosophical underpinnings are constructivism, humanism, and critical theory. Over the past thirty years, a rich set of new approaches has evolved, including the role of transformative learning in organizational learning (Watkins, Marsick, & Faller, 2012) and leadership development (Gunnlaugson, 2011). The pedagogy of transformative learning has received widespread attention in higher education and professional development (e.g., Brookfield, 1995, 2004; Cranton, 2006; Kasworm & Bowles, 2012).

The view presented here is based on Mezirow, as his articulation continues to be the foundation for ongoing elaboration and critique. His definition of transformative learning is this:

Transformative learning refers to the process by which we transform our taken-for-granted frames of reference (meaning

perspectives, habits of mind, mind-sets) to make them more inclusive, discriminating, open, emotionally capable of change, and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide action. Transformative learning involves participation in constructive discourse to use the experience of others to assess reasons justifying these assumptions, and making an action decision based on the resulting insight (Mezirow, 2012, p. 76).

This movement toward greater mental complexity has elements of Kegan's self-authoring and self-transforming minds.

The three central elements in the process are experience, dialogue, and critical reflection (Taylor & Cranton, 2013). Experience, a key component of adult learning in general (Merriam, Cafferella, & Baumgartner, 2007), is the ground for meaning making and critical examinations of assumptions. This often comes in the form of a disruptive event or troubling situation ("disorienting dilemma").

Dialogue is important for exposing us to other experiences, broadening our perspectives, and developing beliefs that are more justified for action. At the same time, dialogue fosters dispositions and practices needed for full participation in a democratic society—a set of commonly accepted norms of communication, accurate and complete information, active listening, absence of domination, willingness to critically question assumptions, and withholding judgment "until one empathically understands another's point of view" (Mezirow, 2012, p. 81).

The crux of transformative learning is critical reflection. While this may involve many of the skills and dispositions of critical thinking (e.g., Bailin *et al.*, 1999; Ennis, 2011) and reflective practice (e.g., Argyris & Schon, 1974; Schon, 1983), transformative learning theory places distinctively strong emphasis on questioning the assumptions on which frames of reference are predicated. This is done in two ways:

critical reflection on the assumptions of others (CRA) and critical self-reflection on one's own assumptions (CSRA) (Kreber, 2012; Mezirow, 1998, 2012). Because CSRA can be highly threatening emotionally, support from trusted, empathetic others is important.

The use of CRA and CSRA has been the basis for many efforts to foster learning transformations and social change. Critiquing dominant ideologies challenges oppressive beliefs and breaks their hold on us. In the workplace, critical reflection can support "more open-ended, frank exploration of the disorienting reality of the current situation, the root causes of the problems we face, and creative alternative responses" (Watkins, Marsick, & Faller, 2012, p. 385).

The explicit goal of transformative learning theory is to use the desire for change arising from a disruptive event or disturbing situation to develop beliefs that are more true or justified to guide future action. Of the theories reviewed in this article, only transformative learning theory holds critical theory and social critique among its central concerns.

## **Implications for LIS Education**

These three transformational learning approaches provide different possibilities for fostering the adaptive leadership skills discussed earlier: (1) question the paradigm, (2) think and act collaboratively, (3) experiment to understand the problem and emergent solution, (4) use conflict to mobilize creative responses, and (5) do continual high-level reflection. Table 1 explores this potential by suggesting how each approach is relevant to developing the skills needed to solve wicked problems. A notable gap among the approaches is the lack of focus on experimenting with emergence in novel situations.

The main concern of all three approaches is transforming high-level meanings that are limiting into beliefs that empower. All three approaches describe learning

processes that begin with a conflict and mature through deep reflection.

The approaches differ in their focus and ways of moving toward higher levels of mental complexity. Immunity to change focuses on transforming individual and group frames of reference in order to change practice. The three levels of mental complexity provide a means for understanding individual differences, and the immunity mapping process is detailed and applicable at any level of complexity.

Threshold/variation theories focus on disciplinary knowledge. Together, they call attention to the need to identify threshold concepts and illuminate the dynamics involved in learning them.

Transformative learning theory focuses on critical reflection on assumptions to undermine self-limiting mindsets and socially oppressive beliefs with the ultimate aim of changing society for the better.

What are the implications for LIS education? In the aggregate, LIS programs already require students to apply critical thinking skills, management perspectives, and critical pedagogy to investigate and analyze discipline-based problems and to find socially responsible solutions. An understanding of transformational learning approaches and their judicious use can strengthen the curriculum by systematically promoting the thinking and action that support student growth to higher levels of mental complexity. Meeting the challenge of wicked problems is a clear imperative. The issues identified by the 2014 ALA Summit and the 2013 ACRL environmental scan mentioned at the start of this article are largely wicked problems. In their study of electronic records management as a wicked problem, MacLeod and Childs (2013) found that nearly one third of the "people issues" were in the complex domain, requiring complex adaptive systems thinking.

It is beyond the scope of this article to delve into pedagogy, but the implications for teaching are challenging. As Baillie, Bowden, and Meyer (2013, p. 240) point



Table 1. Preparing for Complexity and Wicked Problems through Transformational Learning Approaches.

<b>Solving Wicked Problems</b>	<b>Immunity to Change Process</b>	<b>Threshold/Variation Theories</b>	<b>Transformative Learning Theory</b>
Question the paradigm	Through immunity mapping, individuals & groups identify hidden commitments & major assumptions that obstruct change.	One questions inadequacies in one's view of a threshold concept & moves to a more powerful, complete understanding.	Critical reflection on assumptions (self & other) questions deeply held meanings & is often used for ideology critique.
Think and act collaboratively	Group immunity mapping leads to shared understanding & commitment, & recognition that everyone has immunities & is responsible for change.	Not explicitly addressed, as the focus is on individual learning.	Dialogue is used to understand diverse views, attain a more inclusive frame of reference. Conditions for communication foster democratic participation.
Experiment to understand the problem and emergent solution	Not explicitly addressed.	There is a focus on novel situations, though testing for emergent solutions is not explicitly addressed.	Not explicitly addressed.
Use conflict to mobilize creative responses	Inability to achieve high priority goals is used to uncover self-defeating behavior & to change limiting beliefs; the process builds capacity to manage anxiety related to change.	Inability to grasp a threshold concept drives shifts in awareness & discernment; the process builds capacity to manage confusion, ambiguity & threats to identity in liminal states.	A disorienting dilemma is the stimulus to examine & transform inadequate or oppressive beliefs; the process builds capacity to manage disturbing emotions, (e.g., fear, anger, guilt, shame).
Do continual high-level reflection	Immunity mapping supports focused, structured, persistent, active reflection to uncover major assumptions underlying self-defeating behavior.	In a liminal state, one continually reconsiders variants in meaning until conceptual breakthroughs occur. By definition, threshold concepts are high-level.	Critical reflection on assumptions (self & other) is used to transform frames of reference (high-level meaning structures).

out, the challenge of curriculum design is to ensure that students experience “real, previously unseen situations; experience variation both within and between situations; exercise authentic professional discernment and judgment in each situation; reflect on experience . . . and have each new experience building on those that came before.” One compelling pedagogical choice is service learning.

## Conclusion

While disciplinary expertise and knowledge of best practices remain fundamental, it has been argued that higher levels of mental complexity and adaptive capabilities will be needed to manage an increasing number of novel situations and wicked problems likely to emerge in the future. This article has reviewed three transforma-

tional learning approaches with the potential to guide student growth toward these higher levels—through changing practice, transforming disciplinary understanding, and developing new perspectives for social justice. The intent of this exploratory look at the shape of future challenges and effective responses is to provide an overview of key areas of need and a sensitizing framework for the integration of transformational learning approaches in LIS curricula. It is hoped that this will stimulate debate and new ideas for how to help LIS students prepare for the complex challenges of the future.

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